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PROCESS AND DEVICE FOR ATTACHING LABEL JACKETS TO OBJECTS

Description

The invention relates to a process and a device for the attachment of label jackets to products.

A corresponding machine is known from European Patent No. 0 584 516. This machine has a revolving table, with dishes that are arranged at regular intervals on a common sector of a circle, for the free standing uptake of bottles. On each one of these dishes, a roll of labeling hose, an installation for the separation of label jackets, and a pair of separating jaws that can be lowered and lifted for seizing the separated label jackets and to pull them over a bottle, are arranged in a manner so that they rotate.

The drawbacks of this construction design are the considerable cost and the fact that replacement of the numerous rolls of label hose is time consuming. Because of the free standing bottles, the speed of revolution and thus the production output are considerably limited. Furthermore, on the one hand, the evenness of the height of attachment of the label jackets to a multitude of bottles is unsatisfactory, and, on the other hand, the operating reliability is critical, especially when the external wall of the bottles are wetted with a fluid. These drawbacks are connected with the fact that a label jacket, at the time when the force of friction between the label and the bottle is greater than between the separating jaws and the label, stops the axial relative movement with respect to the bottle and adheres to it. The height of attachment of the individual jacket labels depends on the individual friction conditions and, therefore, it is not exactly defined. Moreover, the operating reliability is problematic when the separating jaws return to their original upper starting position, because there are still bottles on the support dishes.

The invention is based on the task of providing a process and a device with high fitting precision and operating reliability.

This process task in question is solved by the characterizing portion of Claim 1 and the device task in question is solved by the characterizing portion of Claim 9.

According to the invention, the bottles are seized, before a label jacket is pulled over them, in the area of their mantle surface, until the separating jaw pair which holds a label jacket, coming from above, surrounds, in a manner which is known in itself, at least for a portion of the longitudinal extent of the bottle to be fitted. In the subsequent course of the operation, the holding device for holding the bottles by their mantle surface is temporarily released, and the label jacket is pulled by the separating jaw pair, with simultaneous support of the bottom of the bottle, to the desired final position, where the lowering movement of the separation jacket pair is then stopped, while the label jacket continues to be held at its lower edge with friction lock by the separating jaws. Then the bottle is again seized by a part of its mantle surface which in the meantime has been covered with the label jacket that has been pulled over it, where the label jacket is held by friction lock or pressed against the external side of the bottle. The separating jaw pair releases the hold grip on the forward lower margin of the label jacket only then, and it is then lowered completely under the standing surface of the bottle. During this lowering movement of the separation jaw pair, the label jacket, advantageously, can no longer change its height position on the bottle, so that the position of the label jacket with respect to the bottom of the bottle is maintained uniformly with great precision in the case of a multitude of bottles, that is the height position tolerances of the height of adhesion can be kept in a very small range.

Advantageously, the separation jaw pair is designed in such a manner that its coupling action, with friction lock, is simultaneously applied to the radial internal and the external surface, and, as a result, it is possible to avoid an unnecessary large widening of a label jacket to generate sufficient frictional forces.

Since, in the proposed process, a bottle is supported at all times by its circumference, before, during and after the pull-over application of a label jacket, by an area of its mantle surface, high speeds of rotation can be achieved with an accordingly high production output without tipping of the bottle.

According to an embodiment variant of the invention, the separation jaw pair is lifted into the original upper position, only after the removal transport of the bottles that have been provided

with a label jacket from a bottom dead center position, so that, advantageously, no disturbances can be caused by collision with a bottle or jamming of the separation jaws.

A particularly advantageous embodiment is one where the movements in height of the clamp jaw pair for pulling on the label jacket and for the return movement into the starting position is controlled by a cam control, but caused by a working cylinder or another appropriate drive (engine, etc.), because, as a result, the processing times, particularly the return time to the initial position, can be kept shorter than with a pure cam control, because there is no risk of self inhibition. The angle of rotation of the revolving table required for a complete cycle of movement of the clamp jaws is, accordingly, reduced, that is a smaller revolving table diameter is sufficient, with the same output level.

Other advantageous embodiments of the invention are the topic of the secondary claims.

Below, a preferred embodiment variant of the invention is explained with reference to the figures. In the drawing:

Figure 1a shows a machine with a revolving table for pull-over application of label jackets to bottles in a simplified diagrammatic top view,

Figure 1b shows a radial cam assigned to the revolving table for the actuation of gripper clamps provided on the revolving table to hold bottles, as well as star wheels to load and unload the bottles in a top view,

Figures 2a-2c show a vertical cross section through the revolving table of Figure 1 seen in the direction of the arrow A, in different operating positions,

Figures 3a-3c show a diagrammatic top view of a separation jaw pair to seize and pull over label jackets in different operating positions, corresponding to the series of Figures 2a-2c,

Figure 4 shows a vertical complete cross section through the revolving table of the machine in Figure 1,

Figure 5a shows a partial cross section of Figure 4 in an enlarged representation,

Figure 5b shows a partial cross section corresponding to Figure 5a with an additional label jacket support,

Figure 5c shows a top view of a label jacket support of Figure 5b,

Figure 6 shows a side view of a separating jaw unit in the viewing direction X in Figure 5a,

Figure 7 shows a top view of a separation jaw unit in the viewing direction Y in Figure 5a,

Figure 8 shows the development view of the radial cams for the movement in height of the separation jaw units,

Figure 9 shows a top view of a bottle seizing unit at the revolving table of the machine according to Figure 1b in two different positions, and

Figure 10 shows a variation of the machine according to Figure 1 with two revolving tables in a diagrammatic top view.

The machine 1 shown in Figure 1a essentially consists of a horizontal table top 2, on which a revolving table 3 is rotatably secured with rotation about a vertical axis 3', which revolving table is provided with several bottle dishes 4 arranged at regular intervals on a common sector of the circle. With displacement, a feed star wheel 5, with associated feeding conveyor 7, and a one-piece endless screw 8 and a delivery star wheel 6, with associated removal conveyor 9, are located on the revolving table 3, with circumferential displacement.

Both the feed start wheel 5 and the delivery star wheel 6 are equipped at their periphery with seizing devices to seize and hold bottles at their mantle surface (Figure 1b). These gripping devices, for example, with swivel clamp arms which are in opposite direction in pairs, can be controlled at different places of their circumferential path, from a gripping position into a release position. Such clamp star wheels are described in detail, for example, in US Patent No. 5607045.

Above the common transfer point I between the revolving table 3 and the feed star wheel 5, a cutting block 10 is provided on a cross bar 13, where the cutting block is held in fixed position, for the feeding, unfolding of a film hose and for cutting off label jackets E, where the label film hose 11 is pulled off a hose reservoir 12 which is secured laterally to the machine, and, in the process, it is led to the cutting block 10 over several deflection rollers. The mentioned cross beam 13 can be adjusted, in its height, for adaptation to different label jacket lengths, advantageously by an electromotor adjustment device, which is not shown in detail. The cutting block 10 can be constructed according to the Published German Patent Application DE 2950785 A1.

The revolving table 3, the star wheels 5 and 6, the conveyors 7 and 9, as well as the one-piece endless screw 8 are driven continuously with synchronous speed and positioning with respect to each other, in a circular movement, by individual motor drives or a common machine drive and drive elements. The cutting block 10 has drive devices to effect, synchronously with respect to the movement of the revolving table, the advance, with exact positioning, of the label jacket hose and the cutting off of label jackets E by the cutting tool of the block 10. Reference is made to the above mentioned German Patent Application concerning the exact construction.

The construction of the revolving table 3 is explained in greater detail below with reference to the vertical cross sectional representation shown in Figures 4 and 5a. The base of the revolving table 3 is formed by a horizontal support disk 30, which is secured, so as not to allow rotation, at its center to a vertical main shaft 31, and which bears, on its top side, the bottle dish 4 (not shown in the left half of Figure 4). Each bottle dish 4 is associated with a pair of parallel guide rods 32 in a vertical position on the top side of the carrier disk 30, which pair is located radially inside the imaginary sector of a circle, on which the bottle dishes 4 are arranged. The ends of the

guide rods 32 which are turned away from the carrier disk 30, and turned upward, bear a ring disk 33, whose middle is empty, and which is arranged parallel to the support disk 30, on which ring disk several double-action pneumatic cylinders 34 are secured in a vertical upright position, in each case in the middle between a pair of guide rods 32, with associated control valves 60. To guarantee a stable hold of the cylinders 34, the vertical upward housing ends of these cylinders are connected by a second ring disk 35, which also has an empty middle. The piston rod 36 of the double-action pneumatic cylinders 34 can be moved out, vertically and in parallel, between a pair of guide rods 32 where, in the first ring disk 33, a hole is present in each case in a position in the middle between the guide rods 32, to allow the free penetration of the piston rods 36.

The downward pointing end of the piston rod 36 is secured to slide block 37 which preferably has two parallel bore holes, each of which is penetrated by a guide rod 32, which slide block, on its back side turned toward the main shaft 31, presents an upper and lower guide roller 38 or 39. The guide rollers 38 and 39 are, in each case, rotatably secured to swiveling levers 38b or 39b (Figure 6), which in turn are secured to slide blocks 37. In the swiveling range of these levers, shock absorbers 38c and 39c, respectively, with terminal abutments are attached to the slide block.

The top guide roller 38 is applied against the control surface of an upper, cylindrically bent, radial cam 40, which is attached to the circumference of a horizontal disk 42. This disk 42 has a pipe-like attachment, which is secured with pivot bearings to the top end of the main shaft 31. At the bottom side of the disk 42, there are several separator bolts 44, which hang downward, and which are displaced at regular intervals over the circumference. At the lower ends of the separator bolts, a circular disk 43, with empty middle, is attached, which carries at its circumference a bottom radial cam 41 for the other guide rollers 39, with central attachment. In addition, the bottom radial cam 41 is held in a position so it cannot rotate by a clamp piece 45 provided on the separator bolts 44. The bottom radial cam 41, which is also cylindrically shaped, has a control surface pointed upward, on which the guide rollers 39 move.

The course of the curves of the two radial cams 40 and 41 can be seen in detail in the development view represented in Figure 8, where the running direction of the guide rollers 38,

39 is directed, starting from the 0 degree mark (see also Figure 1b), in the direction of the arrow from the right to the left. In order to be able to use the machine 1 to process different bottle types and/or jacket labels E, where the adhesion height, that is the lower margin of the label jacket with reference to the bottom of the bottle, can be different, the lower radial cam 41 has a curve section 41b (see Figure 8) whose height can be adjusted continuously, and whose control surface determines the adhesion height of the label jacket E on the bottles F. This curve section 41b is connected in each case with two slide bushes 48 which are led in a manner so they can slide on two separated separator bolts 44 and which can be lifted or lowered, continuously, by means of a threaded spindle which is not shown (Figure 4).

In order to prevent the radial cams 40 and 41 from also turning, an angular torque support 46 is attached to the top side of the disk 42, which supported is braced by a stationary column 47 arranged, outside of the revolving table 3, vertically on the table top 2.

The bottom dishes 4 which are arranged on a common circle sector of the support disk 30 at a fixed height, and which in each case are surrounded by a centering ring 14 secured by a spring method, whose coaxial height can be moved, and which presents a margin which surrounds and holds the bottle dish 4, and extends above it, and which is adapted to the contour of the bottom of the bottle. This centering ring 14 is coupled with a rod 15 which is led in a manner so it can be shifted in the support disk 30, which projects with its lower end over the bottom side of the support disk 30 and supports a guide roller 17 (Figure 5a). Below the support disk 30, at the circumferential path of the guide rollers 17, a radial cam 18 is attached in a manner so it cannot be turned on the table top 2, which, in the circumferential area from the delivery star wheel 6 to the feed star wheel 5 effects a lowering of the guide rollers 17 against the return force of a coil spring 16 with permanent vertical upward action. In this process, the upper margin of the centering ring 14 is held, during the feeding and delivery of the bottles F on the bottle dishes 4, under the top side of the bottle dishes (Figure 2c).

In addition, each bottle dish 4 is associated with two shafts 19a, 19b, which are arranged at an interval, parallel and vertically with respect to each other, with rotatable securing in the carrier disk 30. Each of these shafts supports at its top end a horizontal grip arm 20a and 20b,

respectively, which extends outward and which is secured in a manner so it can not be turned, which arms together form controllable grip pincers 20 for seizing and holding a bottle F to be labeled on a bottle dish 4 (Figure 9). At the lower end of the shaft 19a, a lever 21a fitted with a elongate hole 22 is attached, and at the lower end of the shaft 19b, a lever 21b equipped with a vertical bearing bolt 23 is attached, in a manner so they can not turn. The bearing bolt carries a sliding block 24 which can be swiveled and which penetrates into the elongate hole, and a guide roller 25 with displaced height, which roll is applied to the radial external control surface of a curve ring 26 which is maintained on the table top 2 in a manner so it can not turn. At the two levers 21a, 21b, a tension spring 27 is applied, which is permanently active in the direction of a closing movement of the gripper clamp 20. The form of the curve ring 26 which has two cam sections which project radially outward can be seen in Figure 1b. When passing this section, the guide roller 25 is pressed outward, where the grip arms 20a, 20b swivel outward in opposite directions. The different positions of a gripper clamp 20 can be seen in Figure 9.

Figure 7 shows the construction of a spreading jaw unit 50 for the friction-positive seizing and pulling over of a label jacket E on the trunk of a bottle F, for example, a PET bottle. It consists of two internal jaws 51a, 51b and the counter arms 52a, 52b associated with them. The internal jaws each have a horizontal application surface 53 for the lower margin of a label jacket and a half-shell 54 which is bent upward, and whose curvature is adapted to the bottle diameter. The following half-shell, in the direction of rotation of the revolving table 3, can have a lower height than the preceding half-shell. The counter arms, which are also curved, each carry two elastic rubber resilient pads 55 which can be applied radially from the outside to the half-shell, and which can be regulated to achieve a uniform seizing of a label jacket. On a support plate 56 which is inserted horizontally and can be quickly exchanged on the slide block 37, two vertical bearing bolts 57 for the internal jaws and two additional vertical bearing bolts 58 for the counter arms are attached, where the bearing bolts 58 freely penetrate two curved elongate holes 59 in the internal jaws. In each case, a hinge 66 is used to couple the counter arms with their corresponding internal jaw, in such a manner that the swiveling of the internal jaws toward each other results in the swiveling of the counter arms away from each other, and vice versa. Close to the half-shells, one of these attracting tension springs 61 engages with the internal jaw. Approximately in the middle between the bearing bolts 58, a control cam 68 which can not be

turned is located on a shaft 62 is secured horizontally in the slide block 37, where the height of the control cam is between the internal jaws. At the opposite end of the same shaft, a control segment 67 which presents a total of three guide rollers 63, 64, 65, is secured in a manner so it can not turn. With the two guide rollers 63, 64 which are arranged on the side of the control segment turned away from the slide block, the symmetrically shaped control cam can, as desired, be adjusted by rotation in the clockwise direction or in the opposite direction by approximately 90° by means of curve section 70 arranged at the circumferential path, while the third guide roller 65, located on the opposite side of the control segment, is used to maintain the label holding position of the spreading jaw unit 50, while its downward movement is used for the pull-over application on a bottle. For this purpose, this guide roller 65 is associated with a vertical longitudinal guidance strip 71, which rotates with the revolving table 3, and where the guide roller runs along this guidance strip during the lowering.

In contrast to the above described embodiment, the counter arms, if appropriately shaped—as shown in Figure 1b—can each be secured with one end rigidly to the diametrically opposite internal jaw.

The course of the operation during the passage of a bottle through the machine is described below, essentially with reference to Figure 1a:

A bottle F which arrives on the conveyor 7 is seized by the one-piece endless screw 8, introduced in an appropriate position into the feed star wheel 5, seized by the latter's controlled clamps and positioned at the common contact point I on a bottle dish 4 of the revolving table 3, where, at the same time, the centering ring 14 is led upward and the associated gripper clamp 20 is closed. The corresponding clamp of the feed star wheel instantaneously releases the bottle.

At the same time, a spreading jaw unit 50 which is associated with the bottle approaches the cutting block 10 as a result of its upward movement, where the half-shells 54 and the rubber resilient pad 55 are separated from each other at this time. At the same time, the label hose 11 is advanced from above downward, and a label jacket E is cut off, which is then located, with its lower margin, on the application surface 53 of the internal jaws 51a, 51b, that is the half-shells

are located within the label jacket and the rubber resilient pad outside. In order to prevent the tipping of the label jacket at the time of the uptake and acceleration in the direction of rotation of the revolving table 3, a concave curved support shell 49 is located at the height of the label jacket E which has just been separated from the hose, which shell moves in the same direction as the revolving table—seen in the direction of rotation--and is applied to the back side of the label, where the support shell 49 is secured with fixed height at the radial external margin of the ring disk 33 by means of a bracket (Figure 5b). Figure 5c shows the shape of the support shell 49 in a top view.

Immediately thereafter, the shaft 62 with its control cam 68 is rotated in such a manner that the half-shells 54 are swiveled away from each other and at the same time the rubber resilient pads 55 are swiveled inward and in opposite directions, until the label jacket is clamped at its lower margin, outside and inside, with friction lock. In the case of a stretchable jacket, the latter is expanded in the process to an extent which is larger than the diameter of the bottle.

When passing through sector II (Figure 1a), the label jacket is pulled, by the separation jaw unit 50 which is pressed downward by the pneumatic cylinder 34, from top to bottom over a bottle F. As soon as the spreading jaw unit, during the lowering movement, approaches the gripper clamp 20 which holds the bottle, the gripper clamp is opened for a short time, long enough so that the spreading jaws are able to pass through the gripper clamp (second half in sector II). Later, the gripper clamp 20 can again be closed, to such an extent that the bottle is led by its circumference, but a sufficient slit remains to continue pulling through the label jacket. As soon as the label jacket has reached the intended adhesion height, the lifting movement of the spreading jaws is stopped, the gripper clamp 20 is completely closed (label pressed against the bottle trunk) and the half-shells 54 are swiveled slightly inward (the clamping of the lower label margin is released). These processes occur in sector III.

Even before the delivery star wheel 6 is reached, the spreading jaw unit 50 is now again lowered, until the half-shells are located completely under the bottle dishes 4 (Figure 2c). In the case of a shrink wrap jacket, the preliminary shrinking (hot air, etc.) for affixing the label can now occur

at the revolving table 3. In addition, the centering ring 14 is lowered now, and the gripper clamp 20 is opened, when the delivery star wheel 6 has seized the bottle for transfer to the conveyor 9.

Then, the pneumatic cylinder 34 is adjusted for lifting, so that the spreading jaw unit 50 again reaches its original upper position before passing the feed star wheel 5 (sector IV).

During the entire treatment process, the bottles are transported without change in height position through the machine.

Figure 10 represents a machine variant for high outputs, which is formed by a mirrored arrangement of two individual machines according to Figures 1a or 1b, that is this double machine has two feed star wheels 5 and 5', two carousels or revolving tables 3 and 3', as well as two delivery star wheels 6 and 6', but only one common conveyor 7, one removing conveyor 9 and the one-piece endless screw 8. The star wheels 5, 5' or 6, 6', respectively, which are opposite each other and which can be driven in opposite directions to each other, in each case contact the sector of a circle of their counter part and they are equipped, at the circumference, with controllable clamps —according to the representation in Figure 1b—which can be adjusted selectively from a seize position for seizing a bottle into a release position, and vice versa, by means of switch cams, not shown, which are arranged in a fixed position at certain places of their circumferential path. This partition measure, that is the interval between two adjacent bottle dishes 4 on the two revolving tables 3 and 3', is twice that of the partition measure of the feed and delivery star wheels 5, 5' and 6, 6'. All the bottles which are supplied continuously in a single track by the feed conveyor 7 are pulled apart by the one-piece endless screw 8 to the partition measure of the feed star wheel 5 and seized by the latter. At the common contact point of the two feed star wheels 5 and 5' each second bottle F is released by the first feed star wheel 5 and simultaneously seized by the second feed star wheel 5'. In this manner, the bottles F and F' are alternately led to the two revolving tables 3 and 3'. Each revolving table is associated in the transfer area of its feed star wheel with a cutting block 10 or 10' for the separation of label jackets E from a label film hose. On the side of the delivery, the finished, labeled, bottles F and F', which arrive alternately from the two revolving tables 3 and 3' at the common contact point of the two delivery star wheels 6 and 6', are again combined to one row and they are transferred

from the delivery star wheel 6' to the removal conveyor 9. As a result of this modular construction, a larger range of outputs can be covered than with only two variants. It is understood that, instead of clamp star wheels, it is also possible to use alternate solutions with differently designed holding devices for the selective seizing of the bottles, such as, for example, vacuum star wheels or similar transport installations.